



EM Certification Strategy for DOE SNF

A Risk-Informed Performance-Based Approach

*Providing for safe,
efficient disposition of
DOE spent nuclear fuel*

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Regulatory Background

Draft 10 CFR 63 proposes NRC's licensing criteria which is:

- Risk-informed performance-based (RIPB)
- Focuses on those items that are important
- Defines important to safety and waste isolation as those items which provide reasonable assurance that high-level waste can be disposed without exceeding the requirements of § 63.111(b)(1&2) and § 63.113(b) .



WIPP Lessons Learned

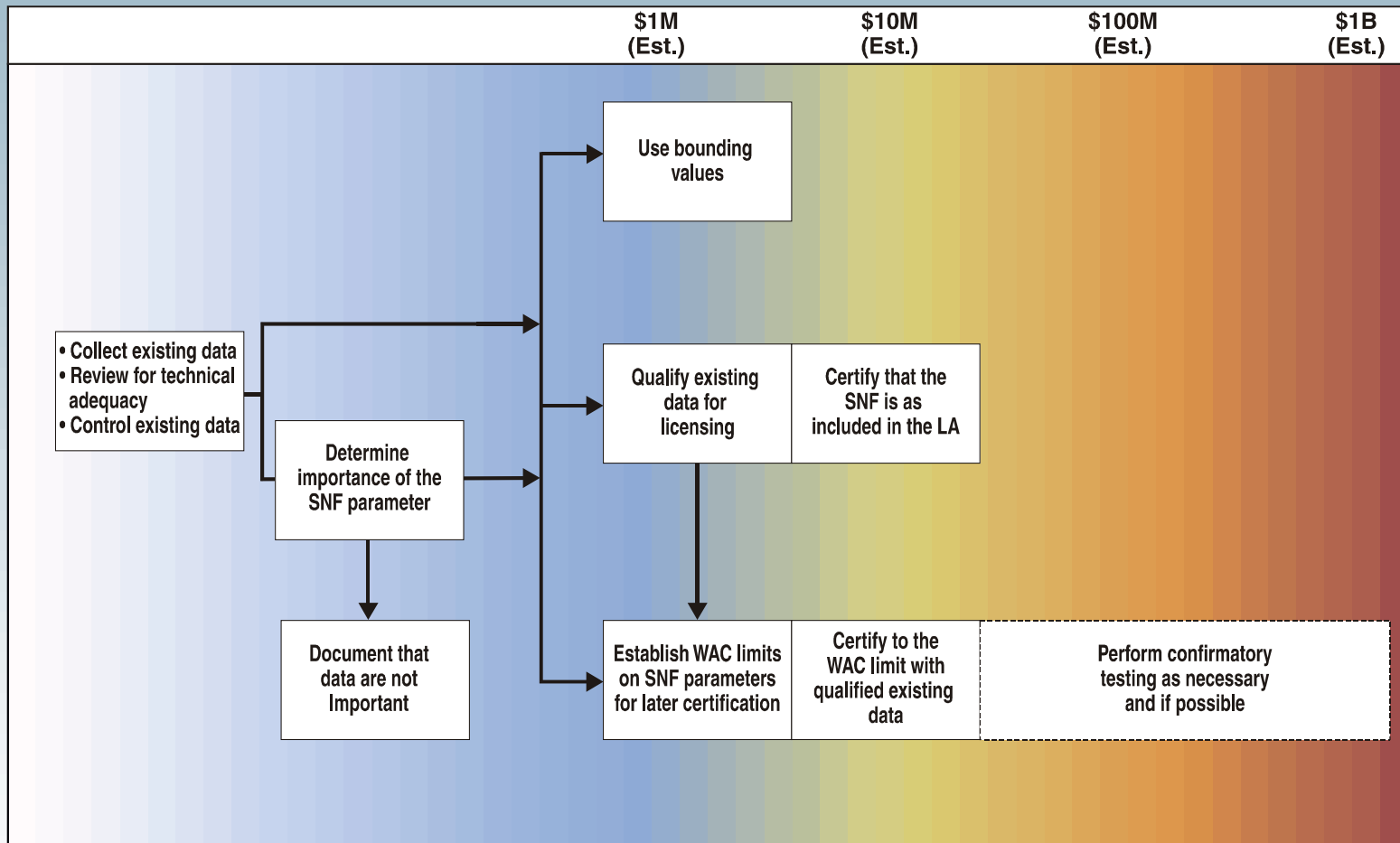
National Research Council recommended:

- DOE should eliminate self-imposed waste characterization requirements that lack a legal or safety basis.
- DOE should develop more realistic models.



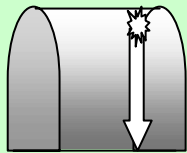
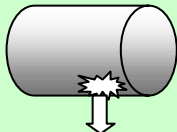
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DOE SNF Licensing & Certification Paths



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Postclosure Event Tree (10,000 year period)

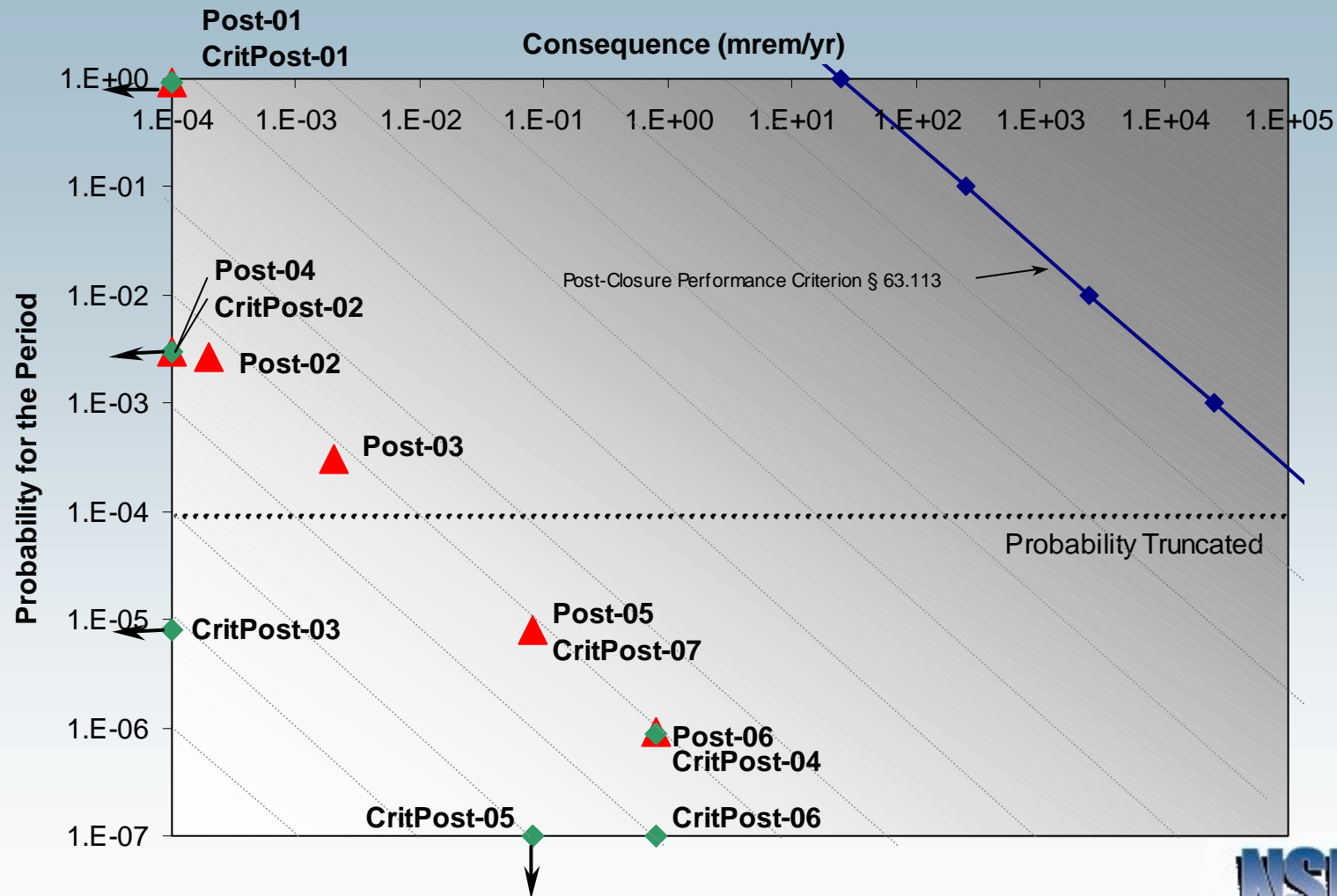
Events				Results		
Drip Shield Failure	Waste Package Failure	Significant Errors in Existing Radionuclide Data	Scenario #	Likelihood (total MGR for 10k yrs)	Consequence (mrem)	Expected Annual Dose (mrem)
		10X X		10 CFR 63.114 only requires inclusion of events $>10^{-4}$ in the 10,000-year period.	10 CFR 63.113 does not provide a consequence limit.	The 10 CFR 63.113 limit is 25 mrem for the 10,000-year period.
				Beyond Screening Criteria:		
				9E-07	x 0.8	= 7.E-07
				8E-06	x <u>0.08</u>	= 6.E-07
				Safety Case:		
				3.E-03	x No release	= 0
				Beyond Screening Criteria:		
				3E-04	x 2E-03	= 6.E-07
				3E-03	x <u>2E-04</u>	= 5.E-07
				Safety Case:		
				0.997	x No release	= 0



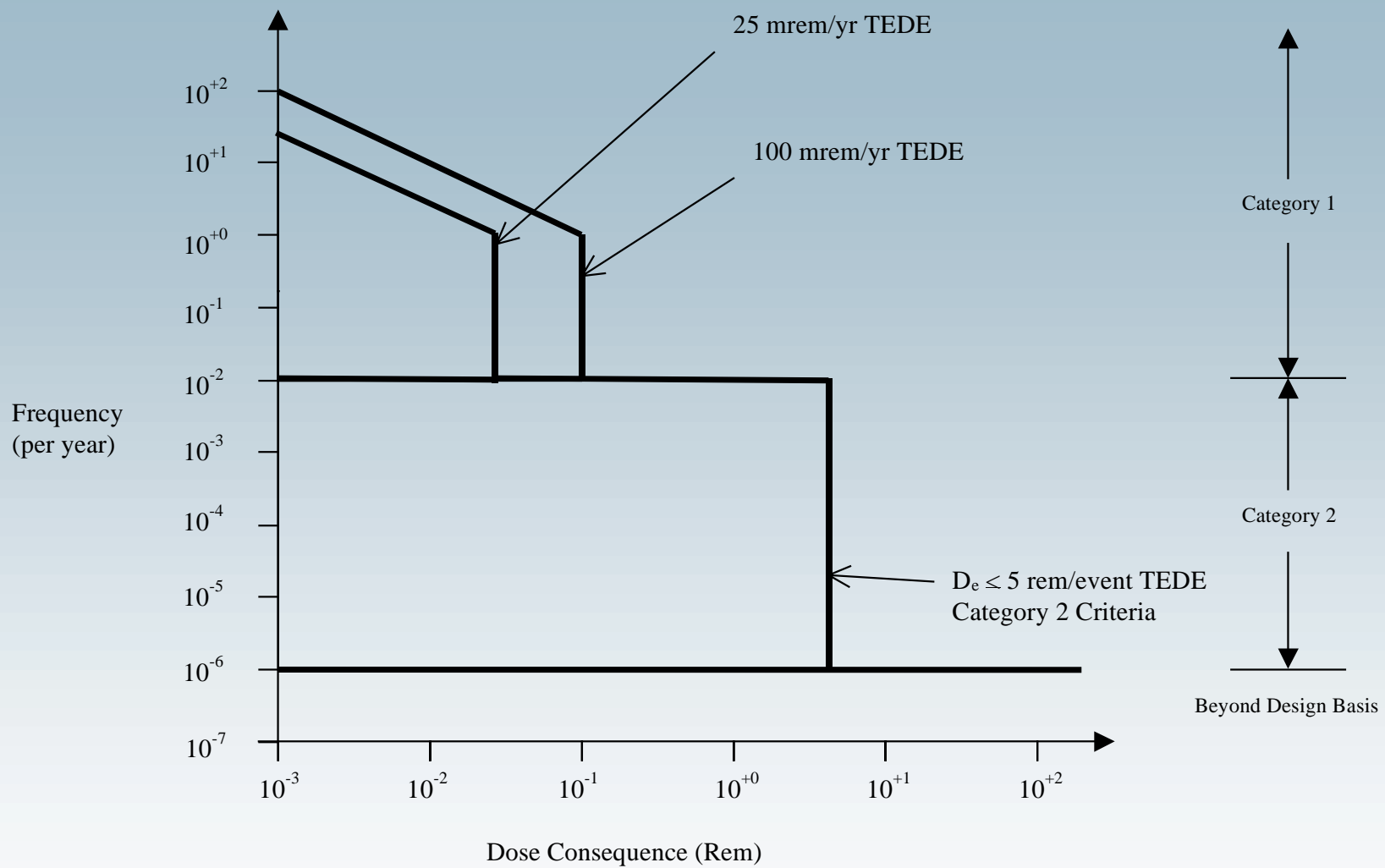
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Postclosure Complementary Cumulative Distribution Function

For Regulatory Period (10,000 yrs)



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Risk-Informed, Performance-Based Conclusions

- DOE SNF parameters do not currently appear to be important for preclosure or postclosure.
- The MCO and Standardized Canister are currently important for a window of time in preclosure.



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Requirements for Design and Licensing Inputs

- EM must ensure all inputs ultimately used are:
 - Identified and documented
 - Reviewed for correctness
 - Approved for use
 - Controlled
- RW must, in consultation with EM, ensure they are suitable for their intended use.



WAC and Certification

- WAC should clearly distinguish limits that are important to safety or waste isolation.
- Only limits that are important to safety or waste isolation should require qualified data.
- Best available data should be adequate for all parameters not identified as important.
- Goal of establishing an ‘approved fuels list’ rather than specific limits.



Backup slides





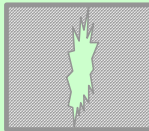
- Preclosure Event Tree



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Preclosure Criticality Event Tree

- For single-package criticalities only -

Events						Results			
Canister Drop	Canister Breach	Free Moderator in Surface Facility	Significant Errors in Existing Fissile Data or Analysis	HEPA Filter Failure	Scenario #	Likelihood for 100-yr period	X Consequence (mrem)	= Expected Annual Dose (mrem)	
			1.1X 			10 CFR 63.111 requirements are truncated at 10 ⁻⁴ for the 100-yr period.	The 10 CFR 63.111 limit is 5,000 mrem for events with a probability >10 ⁻⁴ for the operating period.	The regulations allow category 2 risks in the range of 5E-1 to 5E+3 mrem.	
						Beyond Design Basis (i.e., Category 3):			
						HEPA Failure = 5E-04	CritPre-06		
			Significant errors = 0.1			1E-13	x	1.E+05 = 2E-08	
		Free moderator = 1E-02			No HEPA Failure ~1	CritPre-05			
						2E-10	x	3 = 7E-10	
		Breach = 3E-06			No significant errors = 0.9	CritPre-04			
						2E-09	x	No criticality = 0	
						Safety Case:			
Drop = 0.08			No free moderator = 0.99			2E-07	x	No criticality = 0	
						8E-02	x	No criticality = 0	
						0.92	x	No criticality = 0	
						</			